

Predictors of hospital readmission two years after coronary artery bypass grafting

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Abstract

Objective—To determine the clinical factors before, and in association with, coronary artery bypass grafting (CABG) that increase the risk of readmission to hospital in the first two years after surgery.

Patients—All patients in western Sweden who had CABG without simultaneous valve surgery between 1 June 1988 and 1 June 1991.

Methods—All patients who were readmitted to hospital were evaluated by postal inquiry and hospital records.

Results—A total of 2121 patients were operated on, of whom 2037 were discharged from hospital. Information regarding readmission was missing in four patients, leaving 2033 patients; 44% were readmitted to hospital. The most common reasons for readmission were angina pectoris and congestive heart failure. There were 12 independent significant predictors for readmission: clinical history (a previous history of either congestive heart failure or myocardial infarction, or CABG); acute operation; postoperative complications (time in intensive care unit greater than two days, neurological complications); clinical findings four to seven days after the operation (arrhythmia, systolic murmur equivalent to mitral regurgitation); medication four to seven days after the operation (antidiabetics, diuretics for heart failure, other antiarrhythmics (other than β blockers, calcium antagonists, and digitalis), and lack of treatment with aspirin).

Conclusion—44% of patients were readmitted to hospital two years after CABG. The most common reasons for readmission were angina pectoris and congestive heart failure. Four clinical markers predicted readmission: clinical history; acute operation status; postoperative complications; and clinical findings and medication four to seven days after operation.

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Keywords: coronary artery bypass grafting; predictors; hospital readmission

Patients with severe coronary artery disease can be successfully treated with coronary artery bypass grafting (CABG) with pronounced improvement in relief of angina pectoris.¹⁻³ Approximately three of four patients

are free from ischaemic events for five years after CABG.⁴ Survival is improved only in selected subgroups with advanced coronary artery disease, however,^{5,6} and the surgical procedure constitutes a considerable cost to society. One relatively unresearched aspect of morbidity is rehospitalisation after postoperative discharge. Hospital readmission seems to be an important medical measure of morbidity. This outcome has major implications for healthcare financing as well as patient well-being. The ability to identify in advance patients with a high risk for early readmission has important implications for preventive efforts. The aim of this study was to find predictors for readmission to hospital in relation to previous history, peroperative factors and postoperative complications, and clinical findings and medication four to seven days after CABG.

Patients and methods

PATIENT POPULATION

Between June 1988 and June 1991, a consecutive series of 2365 patients underwent CABG at the department of thoracic and cardiovascular surgery at Sahlgrenska University Hospital and at the Scandinavian Heart Center in Göteborg, Sweden. Patients who had concomitant procedures (valve surgery) were excluded (n = 244), leaving 2121 patients. These two hospitals performed all CABG procedures within the western healthcare region of Sweden during that time period. The region has a population of about 1 600 000.

OPERATIVE TECHNIQUE

All operations were performed using cardiopulmonary bypass and, with few exceptions, moderate hypothermia. Anaesthesia was induced with thiopentone, followed by pancuronium and continued with a combination of fentanyl and nitrous oxide and intermittent administration of a volatile anaesthetic. Myocardial preservation was achieved with a hypercalcaemic, hypothermic crystalloid solution (modified St Thomas). Myocardial temperature was usually monitored and kept under 15°C. Distal anastomoses were performed first in the arrested heart using a continuous running suture technique. Aortic anastomoses were carried out over a partial occluding clamp during reperfusion of the heart and while rewarming the patient.

ACUTE OPERATION

Patients who had an acute operation included:

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those with a diagnosis of unstable angina pectoris and ongoing nitroglycerin infusion or thoracic epidural anaesthesia; those in whom coronary angiography or percutaneous transluminal coronary angioplasty (PTCA) had failed; and those who were developing an acute myocardial infarction or had ongoing ventricular fibrillation.

DEFINITIONS

Renal function

The formula that estimates creatinine clearance (C_{cr}) to describe renal function was adapted from Cockcroft and Gault,⁷ $C_{cr} = (140 - \text{age}) \cdot \text{weight} / (P_{cr} \cdot 72)$ for men and $C_{cr} = (140 - \text{age}) \cdot \text{weight} / (P_{cr} \cdot 85)$ for women. Creatinine clearance is given in ml/min, age in years, weight in kilograms, and serum creatinine (P_{cr}) in mg/dl. Renal dysfunction was defined as C_{cr} less than 60 ml/min.⁷

Obesity

Obesity was defined as body mass index more than 30 kg/m².⁸

Myocardial infarction, congestive heart failure, hypertension, diabetes mellitus, cerebrovascular disease, and intermittent claudication

A history of these conditions before operation was based on patient information and their medical hospital records. All patients were interviewed by a member of the research team four to seven days after the operation.

Smoking

Smoking was defined as consumption of one or more cigarettes daily until three months before the operation.

FOLLOW UP

Confirmation of two year survival was obtained from the Swedish Population Registration System for Swedish citizens. The few foreign patients were contacted by post to

acquire this information. All surviving patients were sent a questionnaire three months, one year, and two years after the operation. Furthermore, the medical records from all referring hospitals were checked during the two years after CABG.

COMPLICATIONS DURING HOSPITAL ADMISSION

Reoperation

Reoperation was undertaken for bleeding, suspected cardiac tamponade, or graft occlusion.

Neurological complications

Patients with clinical symptoms judged by a neurological consultant to be of neurological origin were considered to have had a neurological complication. These complications included changes verified by computed tomography of the brain.

Pneumothorax

Radiographically verified pneumothorax treated with chest drainage.

Supraventricular arrhythmia

Atrial fibrillation or flutter leading to administration of antiarrhythmic drugs or electric cardioversion.

Inotropic drugs

Dopamine or corresponding drugs administered in doses of 6 µg/kg/min or more.

Circulatory assist devices

Intra-aortic balloon pumps (IABP), extracorporeal membrane oxygenation, left ventricular assist devices, and right ventricular assist devices were used. An IABP was not used before operation at our hospitals during the time period.

Perioperative myocardial injury

This condition was confirmed by a rise in the level of serum aspartate aminotransferase (S-

Table 1 Rehospitalisation during two years after CABG

	n	% of 2033	% of 898	Median*	Mean of 2033	Mean of 898	% of all days in hospital
Complications to primary operation	85	4.2	9.5	10	0.64	1.44	7.8
Post-thoracotomy syndrome	28	1.4	3.1	10.5	0.17	0.39	2.1
Acute myocardial infarction	38	1.9	4.2	10.5	0.23	0.51	2.8
Angina pectoris	223	11.0	24.8	6	1.27	2.89	15.6
Chest pain (other cause)	157	7.7	17.5	3	0.40	0.90	4.9
Heart failure	125	6.1	13.9	7	0.90	2.03	11.0
Arrhythmia	121	6.0	13.5	4	0.39	0.88	4.8
Stroke	28	1.4	3.1	13.5	0.47	1.06	5.7
Intermittent claudication	13	0.6	1.4	14	0.09	0.20	1.1
Pulmonary embolism	12	0.6	1.3	7.5	0.05	0.12	0.6
Infection	104	5.1	11.6	7	0.55	1.25	6.8
Renal disease	16	0.8	1.8	15.5	0.16	0.37	2.0
Diabetes	25	1.2	2.8	7	0.11	0.26	1.4
Obstructive pulmonary disease	9	0.4	1.0	5	0.04	0.09	0.5
Cancer	19	0.9	2.1	18	0.34	0.76	4.1
Other surgical disease	84	4.1	9.4	7	0.48	1.08	5.8
Other haematologic disease	15	0.7	1.7	9	0.09	0.20	1.1
Other gastrointestinal disease	34	1.7	3.8	5	0.14	0.31	1.7
Other pulmonary disease	9	0.4	1.0	7	0.05	0.12	0.7
Other endocrine disease	3	0.1	0.3	25	0.03	0.07	0.4
Rheumatic disease/collagenosis	9	0.4	1.0	10	0.05	0.11	0.6
Status post initial AMI	3	0.1	0.3	4	0.01	0.02	0.1
CABG	28	1.4	3.1	13	0.19	0.43	2.3
PTCA	16	0.8	1.8	6	0.06	0.13	0.7
Heart investigation	66	3.2	7.3	3	0.11	0.26	1.4
Psychiatric disease	10	0.5	1.1	12	0.11	0.26	1.4
Other	216	10.6	24.1	5	1.03	2.32	12.6

*Median number of days in hospital.

AMI, acute myocardial infarction; CABG, coronary artery bypass graft; PTCA, percutaneous transluminal coronary angioplasty.

Table 2 Baseline characteristics in patients who were readmitted compared with patients who were not

	Readmitted (n = 898)	Not readmitted (n = 1135)	P
Age ≥ 65 years	447 (50)*	494 (44)	0.005
Females	178 (20)	192 (17)	
Previous MI (1/0)†	587 (65)	645 (57)	< 0.0001
Angina pectoris	880 (98)	1110 (98)	
Congestive heart failure (1/0)	183 (20)	117 (10)	< 0.0001
Hypertension (0/2)	351 (39)	385 (34)	0.02
Diabetes mellitus	143 (16)	104 (9)	< 0.0001
Renal dysfunction (3/1)	276 (31)	265 (23)	0.0002
Cerebrovascular disease	96 (11)	73 (6)	0.0007
Intermittent claudication (2/0)	133 (15)	110 (10)	0.0004
Obesity	116 (13)	133 (12)	
Current smoker (3/0)	124 (14)	13 (12)	
Previous PTCA	51 (6)	54 (5)	
Previous CABG	61 (7)	40 (4)	0.0009
Three vessel disease (48/32)	560 (66)	713 (65)	
Left main stenosis (48/32)	161 (19)	230 (21)	
Proximal LAD stenosis (48/31)	437 (51)	577 (52)	
Ejection fraction < 40% (76/67)	91 (11)	77 (7)	0.004
Acute operation	99 (11)	78 (7)	0.001

*Number of patients (%); †number of patients with missing information. MI, myocardial infarction; PTCA, percutaneous transluminal coronary angioplasty; CABG, coronary artery bypass grafting; LAD, left anterior descending coronary artery.

Table 3 Perioperative factors and postoperative complications among patients who were and were not readmitted to hospital

	Readmitted (n = 898)	Not readmitted (n = 1135)	P
ICU time > 2 days	86 (10)*	45 (4)	< 0.0001
Time in ventilator > 24 hours	48 (5)	15 (1)	< 0.0001
Aortic cross-clamp time > 90 min	63 (7)	53 (5)	0.03
No of grafts > 3	528 (59)	646 (57)	
IMA	67 (7)	918 (81)	0.005
TEA	71 (8)	74 (7)	
Reoperation	57 (6)	53 (5)	
Neurological complication	36 (4)	17 (1)	0.0006
Pneumo/hydrothorax	57 (6)	55 (5)	
Supraventricular arrhythmia	280 (31)	282 (25)	0.002
Inotropic drugs	180 (20)	149 (13)	< 0.0001
Prolonged ECC	13 (1)	9 (1)	
Assist device	19 (2)	7 (1)	0.004
ASAT max > 2.0	255 (29)	268 (24)	0.01

*Number of patients (%). IMA, internal mammary artery; TEA, thrombendarterectomy; ECC, extra-corporal circulation; ASAT, aspartate aminotransferase.

Table 4 Status and medication four to seven days after the operation among patients who were and were not readmitted to hospital

	Readmitted (n = 898)	Not readmitted (n = 1135)	P
Various findings			
Height (cm); mean (SD)	173 (8)	173 (8)	
Weight (kg); mean (SD)	78 (12)	78 (12)	
Heart rate (beats/min); mean (SD) (21/11)*	83 (13)	82 (14)	
Systolic BP (mm Hg); mean (SD) (36/29)	124 (17)	125 (17)	
Diastolic BP (mm Hg); mean (SD) (39/28)	73 (10)	74 (10)	
Arrhythmia (19/14)†	99 (11)	72 (6)	0.0001
Systolic heart murmur (60/68)	158 (19)	155 (15)	0.01
Systolic heart murmur equivalent to mitral insufficiency (61/69)	58 (7)	37 (3)	0.0007
Systolic murmur over the carotides (68/79)	70 (8)	87 (8)	
Medication			
β blockers (25/31)	302 (35)	418 (38)	
Calcium antagonists (15/13)	81 (9)	80 (7)	
Long acting nitrates (15/13)	9 (1)	13 (1)	
Diuretics for heart failure (12/13)	250 (28)	194 (17)	< 0.0001
Digitalis (13/13)	338 (38)	320 (29)	< 0.0001
Other treatment for heart failure (17/16)	35 (4)	28 (3)	
Other antihypertensives (15/13)	48 (5)	42 (4)	
Other antiarrhythmics (15/13)	97 (11)	78 (7)	0.002
Antidiabetics (14/13)	106 (12)	75 (7)	< 0.0001
Aspirin (11/9)	777 (88)	1036 (92)	0.001
Dipyridamole (14/11)	738 (83)	956 (85)	
Apexumarol (14/12)	71 (8)	61 (5)	0.02
Psychopharmaceuticals (14/12)	25 (3)	32 (3)	
Lipid lowering drugs (15/13)	36 (4)	50 (4)	
Other medication (15/14)	382 (43)	400 (36)	0.0006

*Number of patients with missing information; †numbers of patients (%).

STATISTICAL METHODS

Differences between patients readmitted and those who were not readmitted to hospital were examined by Fisher's exact test for dichotomous variables and Wilcoxon's rank sum test for continuous variables—that is, height, weight, heart rate, and blood pressure.

Identification of independent significant predictors for readmission for all variables significantly correlated ($P < 0.05$) with the outcome—that is, readmission for all causes, because of complications, and as a result of cardiac causes, respectively, in the univariate analysis were entered in a stepwise logistic regression. All P values are two tailed and given in the tables if less than 0.05.

Results

A total of 2037 of 2121 patients who had CABG were discharged alive from hospital. Information on readmittance was available for 2033 patients. Seventy six patients (4%) died during the two year follow up. These patients are included in the analyses. In total, 898 patients (44%) were readmitted at any time; 4% were readmitted because of postoperative complications; 31% for cardiac causes, and 23% as a result of non-cardiac reasons. Table 1 shows the number and proportion of patients readmitted to hospital for various reasons and the median and mean number of days that the patients spent in hospital for various reasons. Table 1 also shows the contribution of various diagnoses to the overall number of days in hospital. Angina pectoris was the most important diagnosis, accounting for 15.6% of all days in hospital followed by congestive heart failure.

READMISSION IN RELATION TO PREVIOUS HISTORY

In table 2 patients readmitted and those who were not readmitted to hospital are compared in terms of baseline characteristics. Patients who were readmitted were older, they more frequently had a history of acute myocardial infarction, congestive heart failure, hypertension, diabetes mellitus, renal dysfunction, cerebrovascular disease, intermittent claudication, and previous CABG. Furthermore, they more often had an ejection fraction below 40% and underwent an acute operation.

READMISSION IN RELATION TO PEROPERATIVE FACTORS AND POSTOPERATIVE COMPLICATIONS Table 3 shows that patients who were readmitted more frequently stayed in the intensive care unit for greater than two days and more often required ventilator treatment for more than 24 hours. They more often required an aortic cross-clamp time of more than 90 minutes and were less often given an internal mammary artery graft. In terms of postoperative complications, readmitted patients more frequently developed neurological complications, supraventricular arrhythmia, a serum aspartate aminotransferase maximum level greater than 2.0 $\mu\text{kat/l}$, indicating peroperative myocardial damage, and required inotropic

ASAT, EC 2.6.1.1., normal range less than 0.7 $\mu\text{kat/l}$ to greater than 2.0 $\mu\text{kat/l}$ within 48 hours after the operation.

Table 5 Independent predictors of readmission

	P	OR (95% CI)
Antidiabetics day 4–7	0.001	1.76 (1.24–2.49)
Congestive heart failure	0.002	1.63 (1.20–2.22)
Other antiarrhythmics day 4–7	0.004	1.65 (1.17–2.33)
ICU time > 2 days	0.006	1.90 (1.21–3.00)
Acute operation	0.007	1.65 (1.14–2.37)
Arrhythmia (day 4–7)	0.01	1.57 (1.10–2.25)
Systolic heart murmur equivalent to mitral insufficiency	0.01	1.78 (1.12–2.82)
Diuretics for heart failure day 4–7	0.01	1.38 (1.07–1.78)
Previous MI	0.02	1.28 (1.04–1.58)
Previous CABG	0.03	2.00 (1.08–3.71)
Aspirin day 4–7	0.03	0.68 (0.49–0.96)
Neurological complications	0.04	2.07 (1.03–4.17)

OR, odds ratio; CI, confidence interval; ICU, intensive care unit; MI, myocardial infarction; CABG, coronary artery bypass grafting.

Table 6 Independent predictors of readmission due to complications associated with the operation

	P	OR (95% CI)
ICU time > 2 days	< 0.0001	3.86 (2.07–7.19)
Systolic heart murmur equivalent to mitral insufficiency	0.0001	3.77 (1.91–7.44)
Antidiabetics day 4–7	0.01	2.30 (1.21–4.37)
ASAT max > 2.0	0.02	1.81 (1.09–3.01)
Obesity	0.02	2.03 (1.11–3.73)
Age ≥ 65 years	0.04	1.71 (1.04–2.84)
Aspirin day 4–7	0.05	0.53 (0.28–1.00)

OR, odds ratio; CI, confidence interval; ICU, intensive care unit; ASAT, aspartate amino-transferase.

Table 7 Independent predictors of readmission due to cardiac causes

	P	OR (95% CI)
Previous MI	0.0002	1.54 (1.22–1.93)
Other antiarrhythmics day 4–7	0.001	1.81 (1.27–2.57)
Systolic heart murmur equivalent to mitral insufficiency	0.002	2.09 (1.33–3.30)
Acute operation	0.005	1.72 (1.18–2.50)
Previous CABG	0.005	2.35 (1.29–4.28)
Congestive heart failure	0.007	1.51 (1.12–2.03)
ICU time > 2 days	0.008	1.84 (1.18–2.87)
Aspirin day 4–7	0.02	0.65 (0.46–0.93)
β blockers day 4–7	0.03	0.78 (0.62–0.98)
ASATmax > 2.0	0.04	1.30 (1.02–1.67)
Neurological complications	0.04	1.97 (1.02–3.82)
Aortic cross-clamp time > 90 min	0.04	1.61 (1.01–2.55)

OR, odds ratio; CI, confidence interval; CABG, coronary artery by pass grafting; ICU, intensive care unit; ASAT, aspartate aminotransferase; MI, myocardial infarction.

drugs and assist device more often than patients who were not readmitted.

READMISSION IN RELATION TO CLINICAL FINDINGS FOUR TO SEVEN DAYS AFTER CABG
Table 4 shows that patients who were readmitted more often had arrhythmias, a non-specific systolic murmur, and a systolic murmur, indicating mitral regurgitation.

READMISSION IN RELATION TO MEDICATION FOUR TO SEVEN DAYS AFTER CABG
Table 4 also shows that patients who were readmitted were more frequently prescribed diuretics for heart failure, digitalis, other antiarrhythmics (other than β blockers, calcium antagonists, and digitalis), antidiabetics, and anticoagulants. By contrast, they were less frequently prescribed aspirin.

INDEPENDENT PREDICTORS OF READMISSION
Factors reflecting previous history, the degree of urgency of the operation, complications associated with the operation, clinical findings at four to seven days after the operation, and medication prescribed four to seven days after the operation were independently associated with the overall readmission rate (table 5).

INDEPENDENT PREDICTORS OF READMISSION DUE TO COMPLICATIONS ASSOCIATED WITH THE OPERATION
There were three predictors not related to the overall readmission rate: sign of peroperative myocardial damage, obesity, and age (table 6).

INDEPENDENT PREDICTORS OF READMISSION DUE TO CARDIAC CAUSES
Three predictors that were not significantly independently related to the overall readmission rate emerged: lack of treatment with β blockers four to seven days after the operation, sign of peroperative myocardial damage, and aortic cross-clamp time greater than 90 minutes (table 7).

Discussion
This report describes the frequency of readmission to hospital two years after CABG and attempts to identify independent predictors for readmission. The study population is unique as it includes all patients from a well defined area who had CABG in a specified time period regardless of age and sex.

Few previous studies have reported data on readmission to hospital after CABG. Hamilton *et al*⁹ compared readmission rates for cardiovascular reasons during a six year follow up for a matched pair cohort of 287 patients who received medical management versus 287 patients who received CABG. These researchers found that the annual hospital admission rates for cardiovascular conditions were lower in the surgical treatment group (19%) than in the medical treatment group (26%), which was a consequence of the fact that the surgically managed patients had significantly fewer readmissions for myocardial infarctions as well as readmissions for other cardiovascular reasons. Readmission of patients who did not receive CABG is not known as the study was not designed to answer this question. Neither can we address whether PTCA rather than CABG would have increased or decreased the rate of readmission to hospital.

In the present study almost half of all patients discharged from hospital were readmitted in the subsequent two years. Lubitz *et al*¹⁰ reported that 629 patients were readmitted to hospital per 1000 discharged alive. By contrast, Stanton *et al*¹¹ found that only 24% of their patients were readmitted to hospital during the first six months after the operation.

Obviously, there were a variety of reasons for readmission to hospital. Interestingly, angina pectoris accounted for only 15.6% of all days in hospital during readmission. This indicates that concomitant disease was not uncommon in the study population. It could be argued that some readmissions were due to psychological morbidity rather than cardiovascular morbidity. However, only 1.4% of readmission days in hospital were caused by psychiatric disease and 4.9% by chest pain of a cause other than ischaemic heart disease. Thus, psychological morbidity was not considered as a major contributor to readmission.

The observation that various manifestations of cardiovascular disease before CABG were related to a higher risk of readmission to hospital is not surprising. An earlier study reported that a previous bypass operation was associated with higher postoperative costs after the actual operation.¹² A previous history of myocardial infarction,¹³ congestive heart failure,¹⁴ or diabetes mellitus,¹⁵ is associated with an adverse prognosis in patients with ischaemic heart disease.

Emergency operation also predicted an increased risk for readmission to hospital. Previous studies have been conflicting with regard to the association between the degree of urgency of the operation and the subsequent outcome.^{16,17}

Various postoperative complications, such as time in the intensive care unit of more than two days, arrhythmia, and neurological complications, were related to an increased risk of readmission. A prolonged stay in the intensive care unit might reflect other complications not evaluated in the present study. Postoperative neurological complications are reported to be associated with adverse short term and long term prognoses after CABG.¹⁷

The finding that a systolic murmur suspected of mitral regurgitation was associated with an increased risk of readmission to hospital might reflect a dilated left ventricle secondary to heart failure.

Treatment with diuretics for congestive heart failure four to seven days after the operation was another predictor for an increased risk of readmission to hospital. It is likely that many of these patients have a relatively pronounced left ventricular dysfunction, which explains the observation.

Treatment with aspirin four to seven days after CABG was associated with a reduced risk of readmission to hospital. There are several possible explanations for this finding. Aspirin has been shown to lower mortality¹⁸ and the risk of infarct development in patients with ischaemic heart disease.¹⁹ Furthermore, it reduces the risk of reocclusion after CABG.²⁰ Thus, our observation might be explained by a prophylactic effect of this medication. As this was not a randomised trial, however, the possibility of selection bias cannot be excluded. Many patients who were not treated with aspirin were receiving chronic treatment with anticoagulants, often indicating other severe disease.

Current treatment with β blockers four to seven days after CABG was associated with a reduced risk of readmission to hospital for cardiac reasons. Treatment of patients with ischaemic heart disease with β blockers has been shown to reduce mortality²¹ and the risk of infarct development.²² As with aspirin, however, the risk of selection bias cannot be ignored. Thus, patients with a compromised myocardial function and those with obstructive pulmonary disease are often considered to have contraindications to chronic blockade. It is noteworthy that 40% of patients evaluated in the present analysis participated in a randomised trial comparing the effect of the β

blocker metoprolol with that of placebo, starting treatment four to seven days after the operation. In this prospective randomised trial metoprolol had no effect on hospital readmission rates.²³ However, the withdrawal rate from blind medication was very high, particularly because of the requirement for open treatment with β blockers.

Non-use of mammary artery was associated with an increased risk of readmission to hospital in the univariate analysis but not in the multivariate analysis. This observation indicates that other risk factors for readmission were more frequently associated with patients in whom mammary artery was not employed.

IMPLICATIONS

What inferences can then be drawn from the present analysis? One has to keep in mind that there are some patients who keep returning for attention (and these are more likely to get an intervention) and there are those who just get on with their lives as best as possible. Almost half of the patients who were discharged from hospital were readmitted in the subsequent two years. However, only 39% of the number of days spent in hospital were caused by cardiac reasons. Other causes of readmission included a variety of diagnoses of which the most common were infection, other surgical disease, stroke, and cancer.

Risk indicators for readmission to hospital, which we believe is a relatively strong marker of morbidity, can obviously be defined. Most risk indicators are associated with either the severity of coronary artery disease or complications of the operation. There are also, however, some vague indications that some medications given after the operation might be associated with a reduction in the risk of readmission. Such a hypothesis, however, can be properly addressed only in a prospective randomised trial.

HOW CAN WE REDUCE THE HIGH RATE OF READMISSION?

The extent of coronary artery disease may be favourably affected by intensive lipid lowering treatment. An even more intensive treatment of congestive heart failure might reduce the rate of readmission. A more intensive treatment of diabetes should have priority. Emergency operation should be avoided as much as possible. Improved preoperative and postoperative care might reduce the risk of complications and thereby reduce the risk of readmission. Finally, prospective randomised trials should be performed to evaluate drug regimens after CABG.

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